CLAIM AMENDMENTS

The following is a complete list of claims. The claims below replace all prior versions of the claims in the application. Please amend claims 1 – 7, 15, 16, 26, 47 – 54, 58 – 66, 72 and 73.

1. (Currently Amended) An apparatus to determine the proximity of a dental instrument to a tooth's apical foramen while the instrument is in the tooth's canal, the apparatus comprising:

a handpiece that includes:

a dental instrument operable to remove tissue from a tooth of the patient,

a handpiece driver operable to drive the dental instrument via a mechanical coupling between the handpiece driver and the dental instrument, and

an electrically conductive path that includes at least a portion of the mechanical coupling between the dental instrument and the handpiece driver;

a signal generator coupleable to body tissue of a patient and to the handpiece, wherein, while the signal generator is coupled to the body tissue and the handpiece, the signal generator generates a <u>divider</u> ~~voltage~~ signal that is used to determine the proximity of the dental instrument to the tooth's apical foramen, and that travels the electrically conductive path; and

a microprocessor coupleable to the handpiece and that, while coupled to the handpiece and while the instrument removes tissue from the patient's tooth,

senses a stimulation ~~the voltage~~ signal that includes ~~after~~ the divider ~~voltage~~ signal ~~has been~~ modified by the impedance of the patient's body,

demodulates the stimulation ~~modified voltage~~ signal to isolate the stimulation ~~modified voltage~~ signal from electrical noise received via the electrically conductive path between the dental instrument and the handpiece driver, and

compares the stimulation ~~modified voltage~~ signal to the divider ~~voltage~~ signal generated by the signal generator.

2. (Currently Amended) The apparatus of claim 1, wherein the divider ~~voltage~~ signal includes an amplitude and a frequency.

3. (Currently Amended) The apparatus of claim 1, wherein:

the divider ~~voltage~~ signal has an amplitude and a frequency, and

the microprocessor compares the amplitude of the divider ~~voltage~~ signal generated by the signal generator to the amplitude of the stimulation ~~modified voltage~~ signal.

4. (Currently Amended) The apparatus of claim 1, further comprising a reference impedance coupled to the signal generator and the handpiece such that the reference impedance and the handpiece are arranged in series relative to each other, and the signal generator generates a divider ~~voltage~~ signal across a ~~the~~ combination of the reference impedance, the handpiece and the body tissue, wherein the reference impedance is known.

5. (Currently Amended) The apparatus of claim 1, wherein in response to comparing the stimulation ~~modified voltage~~ signal to the divider ~~voltage~~ signal generated by the signal generator, the microprocessor generates a proximity signal that represents the proximity of the dental instrument to the tooth's apical foramen.

6. (Currently Amended) The apparatus of claim 1, further comprising an analog-to-digital converter that digitizes the stimulation ~~modified voltage~~ signal.

7. (Currently Amended) The apparatus of claim 1, wherein:

the divider ~~voltage~~ signal has an amplitude and a frequency, and

the microprocessor determines the phase of the stimulation ~~modified voltage~~ signal relative to the divider ~~voltage~~ signal generated by the signal generator.

8. – 11. (Cancelled)

12. (Previously Presented) The apparatus of claim 4, wherein the reference impedance essentially consists of a resistive element.

13. (Previously Presented) The apparatus of claim 4, wherein the reference impedance comprises a resistive element and a reactive element.

14. (Cancelled)

15. (Currently Amended) The apparatus of claim 1, further comprising a signal conditioner that includes a low-pass noise filter to isolate the stimulation ~~modified voltage~~ signal.

16. (Currently Amended) The apparatus of claim 15, wherein the signal conditioner includes an amplifier to amplify the stimulation ~~modified voltage~~ signal.

17. – 21. (Cancelled)

22. (Previously Presented) The apparatus of claim 1, wherein the proximity indicator includes a haptic device.

23. – 25. (Cancelled)

26. (Currently Amended) The apparatus of claim 1, wherein the divider ~~generated voltage~~ signal consists essentially of a single frequency.

27. – 46. (Cancelled)

47. (Currently Amended) The apparatus of claim 5 wherein the proximity signal is generated from a look-up table that is stored in an ~~the~~ apparatus.

48. (Currently Amended) The apparatus of claim 5 wherein the proximity signal is generated from an equation that is stored in an ~~the~~ apparatus and executed by the microprocessor.

49. (Currently Amended) The apparatus of claim 1 wherein the microprocessor executes a synchronous demodulation algorithm to demodulate the stimulation ~~modified voltage~~ signal from electrical noise received via the electrically conductive path between the dental instrument and the handpiece driver.

50. (Currently Amended) The apparatus of claim 1 wherein the microprocessor performs a fast Fourier transform of the stimulation ~~modified voltage~~ signal to demodulate the stimulation ~~modified voltage~~ signal from electrical noise received via the electrically conductive path between the dental instrument and the handpiece driver.

51. (Currently Amended) The apparatus of claim 1 wherein the microprocessor performs a single-frequency fast Fourier transform of the stimulation ~~modified voltage~~ signal to demodulate the stimulation ~~modified voltage~~ signal from electrical noise received via the electrically conductive path between the dental instrument and the handpiece driver.

52. (Currently Amended) The apparatus of claim 1 wherein the microprocessor executes a convolving algorithm to demodulate the stimulation ~~modified voltage~~ signal from electrical noise received via the electrically conductive path between the dental instrument and the handpiece driver.

53. (Currently Amended) The method of claim 58, further comprising impeding the divider ~~generated voltage~~ signal with a reference impedance that includes a resistive element.

54. (Currently Amended) The method of claim 58, further comprising impeding the divider ~~generated voltage~~ signal with a reference impedance that includes a reactive element.

55. – 57. (Cancelled)

58. (Currently Amended) A method for indicating the proximity of a dental instrument to a tooth's apical foramen, the method comprising:

generating a divider ~~voltage~~ signal across a combination of body tissue of a patient and a handpiece, wherein the handpiece includes:

a dental instrument disposed in the tooth's root canal,

a handpiece driver to drive the instrument via a mechanical coupling between the handpiece driver and the dental instrument, and

an electrically conductive path that includes at least a portion of the mechanical coupling between the driver and instrument,

wherein the combination includes the handpiece's electrically conductive path and the body tissue arranged in series relative to each other, and

wherein the divider ~~voltage~~ signal is used to determine the proximity of the dental instrument to the tooth's apical foramen;

passing the divider ~~voltage~~ signal through the electrically conductive path;

impeding the signal with the body tissue;

while the dental instrument removes tissue from the tooth, sensing a stimulation ~~the voltage~~ signal that includes the divider signal ~~after the voltage signal has been~~ modified by the impedance of the patient's body tissue;

demodulating the stimulation ~~modified voltage~~ signal to isolate the stimulation ~~modified voltage~~ signal from electrical noise received via the electrically conductive path; and

comparing the stimulation ~~modified voltage~~ signal to the divider ~~generated voltage~~ signal.

59. (Currently Amended) The method of claim 58, wherein generating the divider ~~voltage~~ signal includes generating a signal that includes an amplitude and a frequency.

60. (Currently Amended) The method of claim 58, wherein the divider ~~voltage~~ signal consists essentially of a single frequency.

61. (Currently Amended) The method of claim 59 wherein comparing the stimulation ~~modified voltage~~ signal to the divider ~~generated voltage~~ signal includes comparing their amplitudes.

62. (Currently Amended) The method of claim 59 wherein comparing the stimulation ~~modified voltage~~ signal to the divider ~~generated voltage~~ signal includes comparing the phase of the stimulation ~~modified voltage~~ signal relative to the phase of the divider ~~generated voltage~~ signal.

63. (Currently Amended) The method of claim 59 wherein comparing the stimulation ~~modified voltage~~ signal to the divider ~~generated voltage~~ signal includes comparing their amplitudes and the phase of the stimulation ~~modified voltage~~ signal relative to the phase of the divider ~~generated voltage~~ signal.

64. (Currently Amended) The method of claim 58, wherein sensing the stimulation ~~modified voltage~~ signal includes amplifying the stimulation ~~modified voltage~~ signal.

65. (Currently Amended) The method of claim 58, wherein demodulating the stimulation ~~modified voltage~~ signal includes filtering noise from the stimulation ~~modified voltage~~ signal.

66. (Currently Amended) The method of claim 58 wherein demodulating the stimulation ~~modified voltage~~ signal includes performing at least one of the following: a synchronous demodulation algorithm, a fast Fourier transform, a single frequency fast Fourier transform, and a convolving algorithm.

67. (Previously Presented) The method of claim 58 further comprising generating a proximity signal based on the signal comparison.

68. (Previously Presented) The method of claim 67 further comprising indicating a proximity of the dental instrument to the apical foramen based on the proximity signal.

69. (Previously Presented) The method of claim 67 wherein generating a proximity signal includes retrieving data from a lookup table that correlates at least one signal comparison with a proximity of the dental instrument to the apical foramen.

70. (Previously Presented) The method of claim 67 wherein generating a proximity signal includes executing an equation that correlates at least one signal comparison with a proximity of the dental instrument to the apical foramen.

71. (Previously Presented) The method of claim 67, wherein indicating the proximity of the dental instrument to the apical foramen includes updating the proximity signal.

72. (Currently Amended) An apparatus to determine the proximity of a dental instrument to a tooth's apical foramen while the instrument is in the tooth's canal, the apparatus comprising:

a handpiece that includes:

a dental instrument operable to remove tissue from a tooth of the patient,

a handpiece driver operable to drive the dental instrument via a mechanical coupling between the handpiece driver and the dental instrument, and

an electrically conductive path that includes at least a portion of the mechanical coupling between the dental instrument and the handpiece driver;

a signal generator coupleable to body tissue of a patient and to the handpiece, wherein, while the signal generator is coupled to the body tissue and the handpiece, the signal generator generates a divider ~~voltage~~ signal across the body tissue and the electrically conductive path, wherein the divider ~~voltage~~ signal generated by the signal generator passes through the handpiece driver to the dental instrument; and

a microprocessor coupleable to the handpiece and that, while coupled to the handpiece and while the instrument removes tissue from the patient's tooth,

senses a stimulation ~~the voltage~~ signal that includes ~~after~~ the divider ~~voltage~~ signal ~~has been~~ modified by the impedance of the patient's body,

demodulates the stimulation ~~modified voltage~~ signal to isolate the stimulation ~~modified voltage~~ signal from electrical noise received via the electrically conductive path between the dental instrument and the handpiece driver, and

compares the stimulation ~~modified voltage~~ signal to the divider ~~voltage~~ signal generated by the signal generator.

73. (Currently Amended) A method for indicating the proximity of a dental instrument to a tooth's apical foramen, the method comprising:

generating a divider ~~voltage~~ signal across a combination of body tissue of a patient and a handpiece, wherein the handpiece includes:

a dental instrument disposed in the tooth's root canal,

a handpiece driver to drive the instrument via a mechanical coupling between the handpiece driver and the dental instrument, and

an electrically conductive path that includes at least a portion of the mechanical coupling between the driver and instrument,

wherein the combination includes the handpiece's electrically conductive path and the body tissue arranged in series relative to each other;

passing the divider ~~voltage~~ signal through the handpiece driver to the dental instrument;

impeding the signal with the body tissue;

while the dental instrument removes tissue from the tooth, sensing a stimulation ~~the voltage~~ signal that includes ~~after~~ the divider ~~voltage~~ signal ~~has been~~ modified by the impedance of the patient's body tissue;

demodulating the stimulation ~~modified voltage~~ signal to isolate the stimulation ~~modified voltage~~ signal from electrical noise received via the electrically conductive path; and

comparing the stimulation ~~modified voltage~~ signal to the divider ~~generated voltage~~ signal.